Gas Journal

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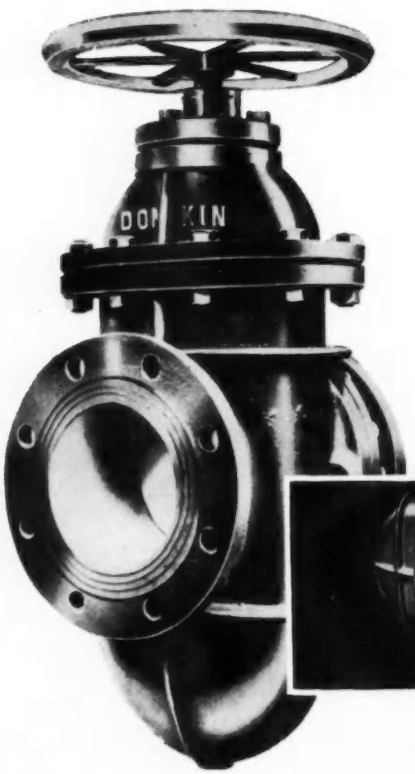

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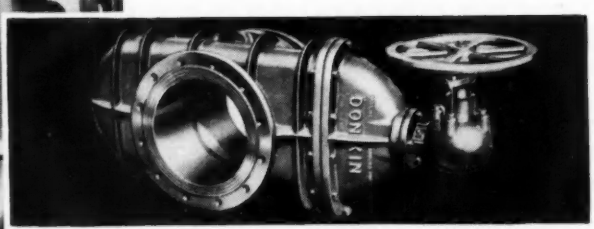

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PUBLISHERS' NOTICE, SEE PAGE 488

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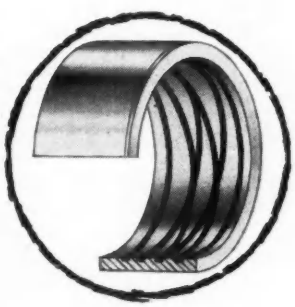

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The three faces of the engineer

THE engineer is the aristocrat of the twentieth century, claimed Lord Chandos, Chairman of Associated Electrical Industries Ltd., when he addressed a conference organised by the Engineers' Guild last Wednesday. The theme of the conference was 'The Professional Engineer—His Employment and Development' and it sought to show the relationship of the engineer to industry and to the world at large. Lord Chandos was concerned with the engineer in society and dealt—very cursorily we thought—with the historical circumstances which led to the rise of the engineer as a force in the modern world.

In the midst of a featherweight dissertation which embraced politics, philosophy and space travel he turned aside to make a very valid plea. He implored the engineering profession to devote a definite part of their time to the study of the English language, so that it might be possible for them to convey their thoughts to their fellow men. 'Only too often the learned professions—among whom, of course, I include engineers—use a vocabulary and syntax which enables them to withdraw, like the ancient alchemists, under a cloud of sulphurous smoke and hide their discoveries from the inquisitions of the outside world.'

While accepting that on technical matters engineers had to use technical terms, Lord Chandos urged, 'When you come to impart your thoughts and use your influence upon mankind, which is one of the duties of an aristocracy, you will have to learn methods of expression which, day by day, I think you are beginning to discard.' And he added: 'It is also necessary, if you are going to be an aristocracy, not to have to rely only upon translation to put you in touch with the teeming thought of our modern world.' Today, for example, only seven people in every 3,000 who were learning a foreign language in Great Britain were learning Russian.

From the engineer in society we turned to 'The Engineer and the Technician' by Mr. D. J. Mann, Director and Head of the Personnel Division of Unilever Ltd. This immediately raised the question, what *is* a technician? Although the word tends to be used to describe people whose functions extend beyond the limits of engineering, within the engineering field the title is applied to supervisory staff who are responsible for the direction of craftsmen, to those who are responsible for the operation of utilities such as boilers, electricity generation, water supplies, refrigeration etc., and to drawing office staff.

Mr. Mann remarked that much of a professional engineer's training has in the past been along the very same route followed by the man who stopped (willingly or otherwise) at a stage short of professional qualification. Are they then such very different people? Is it not reasonable to expect an overlap area in function and interest? Are examination marks of, say, 49% and 51% sufficiently discriminating to make it possible to say one is to be a 'technician' and the other an 'engineer'?

Whether this will be true 20, 30 or 40 years hence is quite another matter, because, as the speaker pointed out, whereas in the early 1950's it was true to say that over half the members of the major professional engineering institutions had qualified via part-time courses at technical colleges, it is now not merely difficult but in some cases almost impossible to qualify this way, and future professional engineers will have taken their examinations after full-time or sandwich courses of university first degree level. But the recent White Paper on technical education ('Better Opportunities in Technical Education') suggests that at higher levels technicians may also be best trained via sandwich or full-time courses leading to Higher National Diplomas, which are also of university first degree level. 'In short, the dividing line, at least on the academic side of their training, is not a particularly narrow line.'

Mr. Mann pleaded for an avoidance of the 'ivory tower' concept of the professional engineer, working on a higher level than the technician, and suggested that the best results might be achieved by having vertical rather than horizontal divisions in organisation, so that a team of workers will include scientists, technologists, technicians and craftsmen, and within the team a rational *modus vivendi* and *operandi* will usually commend itself to all.

The speaker concluded that the contribution which the well-qualified professional engineer has to make is in terms of original thinking, planning and direction of work. 'It may be unwise to encourage the idea that he should be confined to original design work and hand over his designs and plans to "technicians" to implement. Integrated teamwork between engineers and technicians following through development and pilot plant stages into production seems to be increasingly important in

industry. If this concept is accepted, the managerial ability of the professional engineer becomes of great importance '.

This brought us very logically to the third paper, ' The Engineer in Management ', by Mr. A. R. Cooper, Member for Operations and Personnel, Central Electricity Generating Board, who began by referring to ' the great triumvirate—the engineer/accountant/secretary group—which dominates the hierarchy of most industrial concerns ', and describing the point of view on which each would consider himself to be the man best suited for a managerial position in industry.

Much of his paper was concerned with defining the manager's function (a controversial matter, this!), but then we came to the crux of the matter—how can the engineer become a manager? He must, said Mr. Cooper, create the impression that he is ' manager material ' and it would be a definite help to him if, in the public mind, the word 'engineering' had some higher connotation than that of the crude artificer. ' Is it possible ', he asked, ' that big business has formed the habit of regarding engineers as heavy duty animals, biologically unsuited for the subtler intellectual exercises which are part of the business of managing? If this is the case it is up to the engineers to create a different picture of themselves to the world at large. They should seek opportunities to show that it is possible to be both an engineer and a civilised human being.'

The rise of Russian gas

THERE can be little doubt that the West is fascinated by industrial achievements in Soviet Russia. The growing tendency to translate Russian technical papers and scientific and technological abstracts into English seem ample evidence of this. The intense interest of the British gas industry in overseas gas industries both in America and Western Europe pales, it seems to us, before the curiosity it shows in the spectacular advances in the consumption of gas in Soviet Russia since the war.

Undoubtedly Eastern Europe and the immense area under the control of the Kremlin extending as far as the Pacific Ocean has tremendous industrial potentialities, largely shrouded in seemingly impenetrable mystery for many in the West. Any enlightenment of this unknown is of particular interest, and it is for this reason that we are publishing Dr. A. E. Haffner's paper ' Red Gas,' and giving it some prominence.

Before commenting on any of the details of Russian achievements in the development of their gas industry, it is, we feel, necessary to draw attention to the geographical conditions of the country and its fuel resources. The development of any industry in a land mass so vast subject to so many changes in climatic conditions, and with its mineral resources so scattered, depends for its success on good communications, and up-to-date transport facilities.

Clearly the transporting of coal by rail over long distances is a matter of some difficulty since the consumption of fuel by the locomotive becomes an important factor. Some form of fuel which can be carried by pipeline is an obvious solution. Oil and gas immediately spring to mind, so once again we have an example of a gas industry developing at an enormous rate as soon as natural gas is discovered in large quantities and its potentialities realised. As Dr. Haffner points out, although the Russian gas industry was previously insignificant compared with those in other countries (especially Great Britain), gas production in coke oven plants was extensive; its distribution, however, was limited and confined to the comparatively small area in which the coal industry was then being exploited.

Is a country's size so important that there is an optimum above which manufactured gas, as we know it in Britain, cannot be successfully and economically developed? Clearly a well co-ordinated transport system and a highly industrialised population are also essential. And Russia appears to possess neither of these.

Are we to assume then that had natural gas and oil in large quantities not been discovered, industrial activity, and therefore a quickly rising standard of life among the Russian people, would not have been possible?

Perhaps the most noticeable thing about the developments observed by Dr. Haffner is the tremendous grasp of the potentialities of the new processes available and their almost ruthless exploitation, coupled with special techniques developed for the peculiar conditions to be found exclusively in Russia. We gather that the main-laying techniques in common use have been acquired from outside. Mechanical excavators are employed, though often modified for the local terrain, and the welding and pipe protection techniques for the steel mains are all familiar. The transport of pipe and storage tank construction, however, seem to be quite unique. The amount of waste space normally associated with the carrying of pipes on railway wagons, has been solved by fabricating the pipes from flat plates and inflating them under pressure at the site.

Otherwise the main achievements of the modern Soviet gas industry appear to be those of overcoming the considerable obstacles inherent in a very large country under extreme atmospheric conditions of heat and cold. That these are being overcome is a formidable technical advance, and the result of bringing easily transportable fuels to centres of industry, as well as making habitation in remotest Siberia a possibility for ordinary citizens, are clearly of great importance.

But what of the future? Can the tremendous momentum of industrial activity be maintained at today's ever increasing rate, or will a slackening off soon become apparent? The very significant backlog of industrial activity which Soviet Russia has been making up in the last few years should, we feel, bring that country's standard of life up to that of Western Europe in the next decade or so, but after that will there still be the same incentive? Moreover, will natural gas in vast quantities still be there to assist in its development?

Abstract from an address to the Fuel Luncheon Club, London.

A prospect for gas

By W. K. HUTCHISON, C.B.E.,
DEPUTY CHAIRMAN,
THE GAS COUNCIL.

IN the 'Prospect for Gas' that I am about to describe—or should I say 'predict'?—I will assume the mantle of a historian of the gas industry writing in 1980.

The author finds it convenient to begin his review in the year 1955 when, as he observes for the first time, the output of electricity in equivalent thermal units first equalled that of gas and then continued to increase at the rate of 7% per annum, while the output of gas remained more or less constant. His considered opinion is that the gas industry had remained for too long tied to traditional processes, which suffered from a grave lack of flexibility, and to raw materials which were usually stated by the suppliers to be among their highest quality products, requiring to be priced accordingly.

'Too conservative'

'The industry's commercial outlook also', he goes on to say, 'remained far too conservative, as shown by the fact that it was not until 1955 that the suggestion was first made publicly that domestic heating, particularly central heating, offered a market out of which a new prosperity could be created. More remarkable still, it was not until 1960 that the first advertisements appeared in the national daily newspapers for central heating. Among the reasons for what seems now to have been lack of enterprise was an anxiety that at no time should the peak load exceed the capacity to meet it, and a desire to maintain a balance between the sales of the industry's two main products. Did no one realise' he asks, 'how long it takes to build up a new load from the time that the effort is first made? Publicity in a two- fuel industry,' he continues, 'is always subject to a kind of schizophrenia, unless it is realised that each product must be sold on its merits, neither fuel pulling its punches in the interests of the other. If, as a result, sales of the two products are out of balance the remedy is to be found in new processes even if this means abandoning existing processes and traditional raw materials.'

He is more complimentary about events between 1955 and 1960, 'a period', he says, 'which saw the beginning of a revolution in gas industry processes in the teeth of fierce opposition from those who thought that it should continue at all costs, even if it meant ruin for itself, to use the methods and materials of the past', and he ends his review of events leading up to the main period covered by his thesis with the observation that 'the year 1960 saw for the first time a resumption in the upward trend of gas consumption'.

It strikes him as very odd how for a time the public inclined towards the combustion of liquid hydrocarbons in appliances of a kind generally thought to have been rendered obsolete many years before. (This, I think, must refer to the paraffin heater and its predecessor, the oil lamp).

In 1971, under the Open Fire (Psychological Effects) Act, it became obligatory to provide with each television set a coloured and living representation of an open fire capable of being urged into new activity by the action of a specially designed Victorian style poker. The public, thus able to satisfy its traditional inhibitions, was free to enjoy the new standards of comfort and convenience that modern sources of radiant and convected heat could provide.

The almost complete breakdown of road transport during the cold winter that followed the onset of a fresh arctic cycle of weather in 1972 resolved finally any doubts that remained about the superiority of a method of supply that brought fuel quietly and efficiently into almost any dwelling in the country, and the gas boards were quite embarrassed by the demand for a supply of gas even in the rural areas.

In industry, too, gas was expanding its use, not only in traditional processes where convenience and reliability of supply were decisive factors, but in new applications where ionised streams of hot gas could recombine to give temperatures generally thought to be unattainable.

The first faltering steps towards a genuine Clean Air policy having by 1973 eliminated the impurities visible as smoke, the outstanding success of this operation only made more insistent the demand in all our big cities for even higher standards of purity. The elimination of sulphur acids became obligatory and the Ringelman chart was discarded in favour of an infra-red sulphur acid detector.

What is gas?

'It is a remarkable fact', comments our historian at this point, 'that the Act which nationalised the gas industry was unable to define what it meant by gas'. He goes on to say that 11 years later the Wilson Committee, the theme of whose report was stated to be gasification, refused the same hurdle, but compromised by showing how gas, as then understood, could be regarded as a blend of three components—hydrogen, enricher and ballast. Of these, the ballast could normally be had free, and the hydrogen was found to be more expensive than the enricher. Why put in hydrogen if it is expensive, and why put in ballast at all even if it costs nothing? The only answer he can find is that this was the way it had always been from time immemorial.

Not surprisingly he deals at some length with this paradoxical situation and considers that the full implications of the question were only realised in 1963 when liquid methane first became available in commercial operations which followed the successful trials of the Methane Pioneer. 'From then on', he states, 'technologists in the gas industry felt free of the necessity to produce hydrogen

Continued on p. 478

RED GAS — an account of the Sovi

In the U.S.S.R. the rate of expansion in the gas industry is unparalleled in any other country and there is much to be learnt from the impressive programmes for developing the vast and increasing quantities of natural gas being brought into production. The Russians could not have done more for the author than they did in the eight days of his visit to transfer information by papers, films, technical visits, exhibitions, speeches, conversations. He says: 'Every practicable request was granted. The transfer of information was only limited by

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Moscow University, on Lenin Hills (left), is a skyscraper 800-ft. high with a day population of 20,000 students studying science and mathematics. There is hostel accommodation for about 15,000. It cost £75 mill. and took only three and a half years to build.

Soviet gas industry

DR. A. E. HAFFNER, Board Member and Chief Engineer of the Southern Gas Board who recently attended a Council meeting of the International Gas Union in Moscow, collected in eight days what he calls 'a windfall of information which is not easily available.' Some of this he has recorded in a paper which, as Junior Vice-President of The Institution of Gas Engineers, he read recently to the combined Junior Gas Associations of Scotland. Abstracts from this paper follow.

★

IT is necessary to consider the special circumstances in U.S.S.R. The map (Fig. 1) shows the vast area under consideration. A drift of population to the east started by the transfer of whole industries in front of the German invasion has now been stabilised by the development of oil and gas fields in the east, and it is said that it is no longer difficult to persuade workers to move to prosperous Siberian industrial towns with their relatively good standards of new housing and fuel supplies. The population of U.S.S.R. is about four times that of Great Britain and about 20% greater than U.S.A.

The abundantly available resources of gas, oil, coal and lignite are also shown in Fig. 1. The long hauls for coal on an overburdened rail and road system have given an additional incentive to the long distance transmission of oil (Fig. 1) and gas (Fig. 5) by pipelines.

In 1959-60 from coal and oil the U.K. produced for sale 2,600 mill. therms of gas and 3,300 mill. therms of electricity. By 1965 the U.S.S.R. plans to attain with its own particular raw materials, all indigenous, a similar energy level *per capita* as the U.K. It has reasonable prospects of achieving it. Last year there was an annual increase of 32% in gas production. Although gas has a lion's share in these budgets, coal is not to remain static but is planned to rise from 450 mill. tons in 1958 to 625 mill. tons in 1965.

The U.S.S.R. had an insignificant gas industry—but had and still has an important coke oven industry with giant installations, probably the largest in the world—until natural gas was exploited.

By 1955, the thermal output of gas had equalled that

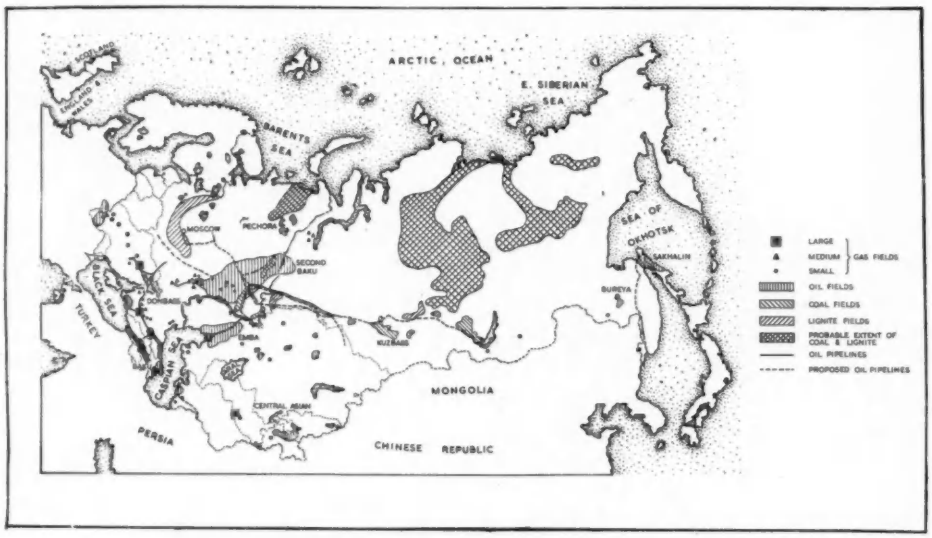


Fig. 1.—Resources of gas, oil, coal and lignite in U.S.S.R.

of Great Britain and by 1960 it had reached the same level of usage per head of population. It now becomes necessary to bring in the U.S.A. to act as a yardstick, so the U.S.S.R. can therefore be said to be at the stage that the U.S.A. were in 1936; there is some possibility of it attaining the U.S.A. level in 1977. The relative populations, U.S.S.R. 209 mill. and U.S.A. 175 mill., should be remembered.

The dominance of natural gas tends to cause other gases to be overlooked and they do not seem to be clearly included in any statistics relating to the total gas used. Any form of conventional gasworks appears to have become quite negligible. There are, however, other sources of gas which are of interest to gas engineers and brief reference is made in this section to coke oven gas, shale gas, Lurgi gas and underground gasification.

There was no opportunity to visit coke oven plants but those remaining are operated by the Ministry of Ferrous Metallurgy for the steel industry and it was reported that the 1960 target was 63 mill. tons.

Most of the gas is used in steel furnaces of the steel works in which the coke oven plant is integrated, but there is often a surplus which is said to be flared because the transfer for domestic and other industrial use does not seem so well developed as in this country.

Shale was not mined until 1916 when British coal supplies failed. A light brown Esthonian shale is gasified to yield about 10% of oil and gas in continuous vertical retorts very much like a Woodall-Duckham retort. Alternatively the shale can be gasified in rich gas generators something like a Tulley or G.I. plant. The shale gas, amounting to 35 mill. cu.ft. per day, is sent to Leningrad about 120 miles, but in the meantime natural gas has reached there and an installation for mixing and governing shale gas and natural gas for the Leningrad supply has been installed (Fig. 10). As the supplies of natural gas mount up the shale gas will cease to be delivered to Leningrad but will be used locally in Esthonia.

Near the Shchekino pumping station about 100 miles south of Moscow, there is a Lurgi plant making about 35 mill. cu.ft. per day from local brown coal. This gas mixed with the natural gas is pumped to Moscow.

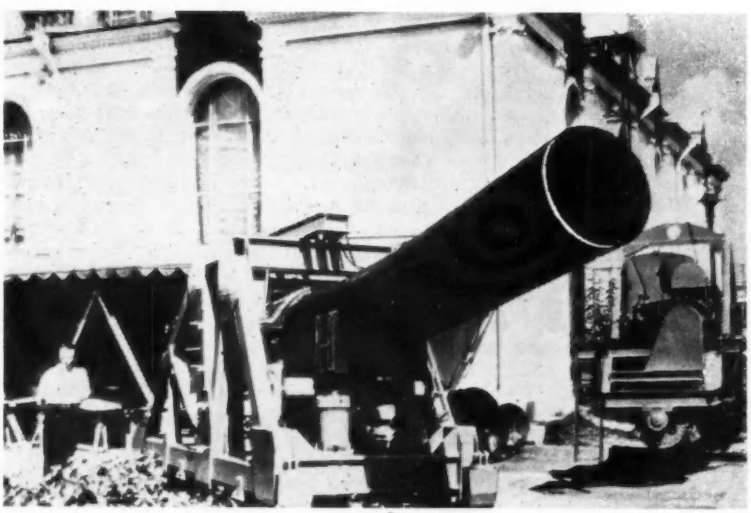


Fig. 2.—Pipe bending machine used in the spread method of main laying.

The Russians have had about 20 years' experience of underground gasification with its low labour requirements, and it has been mainly with thick seams of brown coal, but they have experimented with black coal and also with oxygen. They have developed skilful drilling techniques, and continue to expand in this field, but increase is modest compared with natural gas development. The gas is used for power production and another transport problem thereby solved.

In 1958 the total output of gas from underground gasification was 27,000 mill. cu.ft. but by 1965 it is expected to attain 200,000 mill. cu.ft.[1] of which one station is planned to produce 80,000 mill. cu.ft.

Mainlaying schemes

Rapid expansion in the exploitation of natural gas has involved gigantic mainlaying schemes. It is planned[2] to lay large diameter mains from existing or recently developed gas fields in Central Asia, the Caucasus, the Urals and Siberia, connected in a vast grid system with feeders to industrial areas (Fig. 5). It is planned to lay 16,000 miles of large diameter high pressure mains in the period 1958-65. Construction of the longest gas main—Kuban to Moscow (760 miles); Shehelinka to Ostrogozhsk, 160 miles of 40-in.; and Dashava to Minsk, 350 miles, of 32-in.—is proceeding.

By 1965 a two-line gas main of 40 in. diameter will be laid from the gas field in Uzbek to the Urals—to supply also the Urals with gas from a new deposit in West Siberia in the northern Urals. Another main is being built in Siberia along the route Irkutsk to Krasnayarsk.

The Crimea has a new main across the straits of Kerch to bring gas from Krasnodar. These programmes cover most difficult terrain with mountains, swamps, river crossings as well as exacting climates of eternal snow or arid desert comparable with similar situations in the world where pipelines have been laid, *e.g.*, Canada and Pakistan.

Economical usage

Considerable thought has been given to economy of labour and materials. Lengths up to 80 ft. are supplied on site, wrapping is done on site, and with such sparse population it is easy to do this and to avoid villages. Pressures up to 960 p.s.i. will be adopted and the tensile strength of the steel will be improved.

Cathodic protection is applied and no part of the wall thickness is reserved for corrosion losses. Bituminous, rubber-bituminous, P.V.C., fibre glass enamel and polyethylene have been used or are being developed as protective coatings. Mains have been laid overground in certain localities with economy in effort.

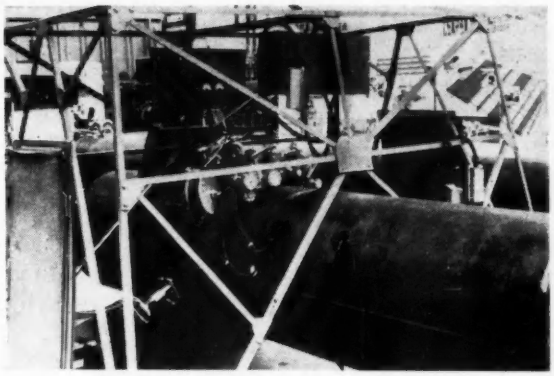


Fig. 3.—Machine welder used in the spread method of main laying.

More mechanisation

Over the past three years the output per mainlayer worker has been more than doubled through increased degrees of mechanisation. Trenchers cutting up to 2,400 cu.yards per hour are used and with special adaptations for cutting frozen ground.

Special caterpillar excavators have been developed for marshlands. Horizontal auger borers for made-up ground and rock are being perfected. Side-boom tractors with a capacity up to 60 tons are being designed. Self propelled machines for hand arc welding, pipe assembling and automatic welding, units for shielded-arc welding and wrapping machines to handle 48-in. pipes are being developed.

The Shchekino pumping station is the ninth and last on the Stavropol-Moscow pipeline which is about 750 miles long. Here there is a compression capacity of 2,000 mill. cu.ft. per day—or 1,000 mill. cu.ft. if the compressors are used in series—consisting of ten piston compressors and seven centrifugal compressors. The output in 1960 was 630 mill. cu.ft. per day during the summer and 900 mill. cu.ft. per day in winter.

This ratio of 1.3 for winter to summer demand is very

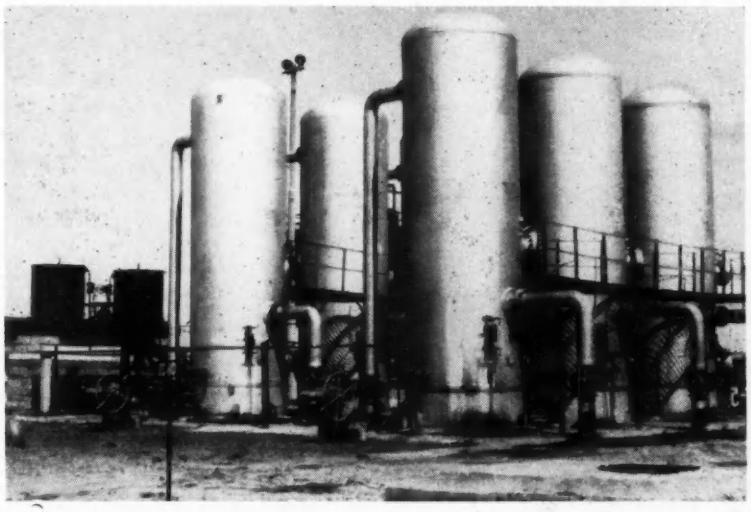


Fig. 4.—Oil filmed dedusters at the Shchekino pumping station.

Fig. 5.

surprising when it is remembered that the January temperatures average 15°F. in Moscow and the August temperatures are 60°F. But the space heating load must be a very small proportion of the total supply compared with industrial usage. It is known that many Moscow power stations change from natural gas to coal in the winter and there may be similar interrupted supplies. The high housing density—say, 80 sq.ft. per person—produces some autothermic heating.

A liquid methane plant, originally meant to help cover the peak load of Moscow, is now being developed for other purposes. The recent completion of the 40-in. main will double the gas available from Stavropol apart from other sources feeding Moscow, and this is another way of covering peak loads.

The gas is cleaned in a group of six Blaw Knox oil-filmed dust filters before passing to the compressors. The 10-cylinder V gas-engine driven piston compressors are 1,000 h.p. each, compressing in three parallel cylinders. There are 10 units. The seven motor-driven single stage centrifugal compressors are each driven by 4,500-kVA motors through 5:1 increasing gear to 7,000 r.p.m. with an absolute pressure ratio of 1.25, *i.e.*, 40 atmospheres at inlet to 50 atmospheres at the outlet. There is one control room for the whole station and there is some radio telemetering from Moscow.

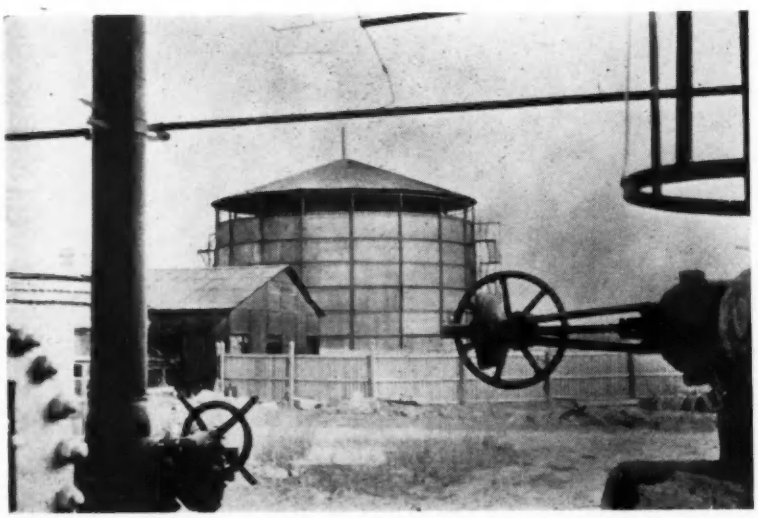


Fig. 6.—Plant used in the storage of liquid methane

The previous station, about 100 miles further south at Efremov, has five gas turbine compressors.

Lurgi gas from brown coal of the Tula brown coalfields amounting to 32 mill. cu.ft. per day is mixed with natural gas after raising the pressure from 17 to 55 atmospheres. This Lurgi gas is regarded as insignificant compared with the natural gas volume.

There are reports that the gas pipelines from the Asian gasfields in Tashkent for the Urals and Moscow will be used for television transmission.

Underground storage

The Russians have started, or aim, to store gas underground near Moscow, Leningrad, Kiev and other cities but without the advantage of spent gas wells (Fig. 5). At Kuibyshev casing-head gases are being pumped into exhausted gas wells and casing-head gases are also being stored at Tataria and Bashkiria—900 miles east of Moscow.

At Leningrad theoretical and practical investigations are taking place under the direction of Professor Charni who is developing *horizontal* aquifers as gas storage within a ring of water under pressure.

At Kaluga, 108 miles S.W. from Moscow and 12 miles from the side of the natural gas main, injection has already begun. Gas is compressed to 110 atmospheres to store at 64 atmospheres in a sedimentary stratum at 2,100 ft. below sea level. The area is faulted in many places and the chosen storage zone is bounded by a fault.

A second storage area two miles away to the S.E. may also be used. Some 40 wells appear to have been sunk and injection has taken place into four wells to the extent of 2,600 mill. cu.ft., beginning in September 1959, but they aimed to have up to 4,200 mill. cu.ft., before this winter. A trial withdrawal took place to the extent of 70 mill. cu.ft., and this was accompanied by twice its volume of water. Out of the perimeter wells at a radius of 1.5 miles water is withdrawn to assist gas storage.

The Kaluga storage system is still regarded as experimental, and if its tightness is confirmed, commercial exploitation will follow. The aim is to inject 1,750 mill. cu.ft., and this is expected to take three months.

Experience has shown how important it is to cement-in the casing very carefully, particularly at the entrance zone into the gas bearing stratum, and to be fastidious in removing oil fog. Withdrawal rate was reduced on occasions by 30% by being clogged with oil fog. Oil-free piston compressors have been used at 25 atmospheres, but similar machines working at 125 atmospheres and 125°C. would be preferable.

Some tests were also made of the distribution of the gas because the original natural gas appeared to have a nitrogen content of about 35% and an H_2S content of up to .5%. The injected gas, however, had only about 14% nitrogen and no H_2S. The withdrawn gas had a composition corresponding with the injected gas, but in one case at the end of the withdrawal period the nitrogen rose to that corresponding to the original stratum gas.

Originally liquid methane was planned to help the peak load problem in the Moscow supply of natural gas from Saratov which was opened up soon after the war. The liquefaction plant is situated 12 miles from Moscow and can draw gas from at least two pipelines. The volumes handled are such a small proportion of the winter peak load that the assistance given to peak load shaving cannot have been very great.

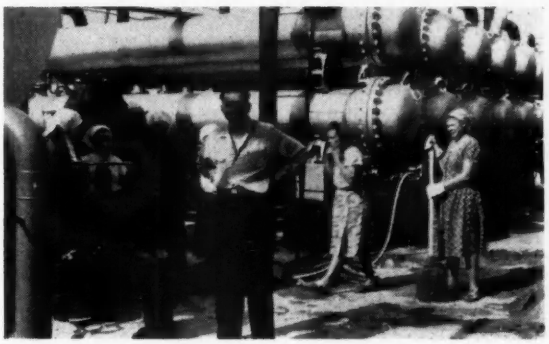


Fig. 7.—Labourers — including women — at a liquid methane plant.

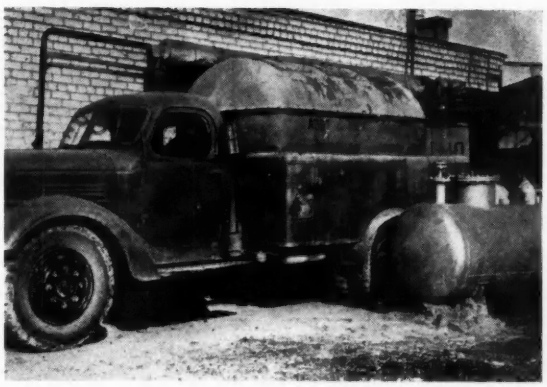


Fig. 8.—The picture to the right shows a liquid methane transport truck.

Fig. 9.—An example of a Russian gas cooker.

The plant built from about 1947[1] has a capacity of about 4 mill. cu.ft. per day and an extension of 20 mill. cu.ft. per day is now being made. Storage systems have not been greatly extended, and it would appear that liquid methane is supplied in liquid form by road or rail truck to those towns and villages beyond reach of the trunk pipelines, and also as a motor fuel and particularly for refrigerated vans. It is of interest to be reminded that liquid methane, derived from mine drainage, was used for transport during the last war at Stoke.

Washing and drying

The natural gas contains up to about .2% of acidic gases, *i.e.*, CO_2 mainly and possibly some H_2S. These are washed out by a mono-ethanolamine plant, followed by drying with diethylene glycol. The purified gas is then further dried with activated alumina down to a dewpoint of $-40°C$. and compressed.

The refrigeration system works on the cascade cycle of ammonia, ethylene and methane. The five compressors made by Clyde, are each of 600 h.p. with six engine cylinders and two compression cylinders. Two units compress natural gas, two ethylene and the fifth ammonia. The plant liquefies about 4 mill. cu.ft. per day.

The storage unit built first was an experimental unit of four stainless steel cylinders set in plastic foam inside an outer steel cylinder. The total capacity was about 6 mill. cu.ft. at s.t.p. The losses were reported to be about 2% per day. A larger unit followed made up of 42 similar cylinders with a total capacity of about 80 mill. cu.ft. at s.t.p. The outer tank is supported on a concrete base with air space below to prevent frost uplift and this was about 4 ft. below ground level with an earth bund around.

The lion's share

The liquid methane is evaporated by compressing to 15 atmospheres in Russian-made centrifugal pumps and passing it to heat exchangers with hot water circulating through them.

Natural gas is getting the lion's share of house heating although district heating from power stations and electrical wall heating have made a small inroad.

There is a fundamental soundness in the priority given to gas as against electricity, because electricity apart from hydro-electricity, is derived from gas, coal or oil at no more than 30% efficiency, and giving a combined production and utilisation efficiency of say 27% compared with a gas utilisation efficiency of about 60%.

In the meantime production and transmission costs were stated in 1958 to be about half of those in 1955.

With modern flats there is still too little space for 'dream' kitchens and there is a custom of supplying the gas central heating plant and the gas cooker as a house fitment. The customer cannot therefore exercise any choice and competitive selling of appliances is absent. This means that the cooker design is very simple (Fig. 9). Very few have thermostats.

With the rapid growth of a gas industry, conventional gasholders can scarcely keep pace and it is rare to see a gasholder. The severe winter sets special problems to water sealed holders and these are often brick enclosed. A holder station at Leningrad—one of the three with two more to be built—was constructed on marshy land in 1948; the installation (Fig. 10) consisted of 150 horizontal cylinders 100 ft. long by 9 ft. diameter with a total capacity of 6 mill. cu.ft. s.t.p., when charged at 110 p.s.i.g. The holders are shaded by fruit trees.

Woman engineer

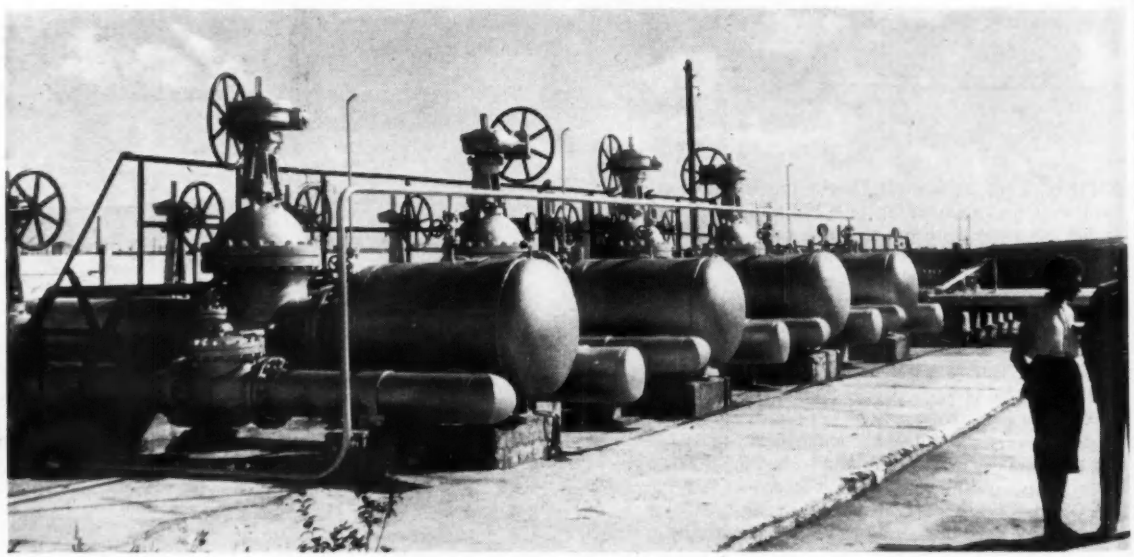
Inlet gas is at 10 atmospheres to 12 atmospheres. Gas to the district is governed down first to 7 atmospheres and then to 2 atmospheres to meet the city's requirements. The gas is two-thirds natural gas and one-third shale gas to give a mixture of 750-B.t.u. gas. The mixing station is separate from the holder station and was in the charge of a very capable woman engineer.

The Russians have been driven by problems of great distances and transport to ingenious devices. The gas and oil pipelines themselves and the priority given to their construction have been dominated by the fact that it is cheaper to transmit them by pipeline than by road or rail on their overburdened road and rail systems.

Two examples (Fig. 13) of the ingeniously prefabricated storage tanks and coiled pipes are submitted, both derived from the Soviet Institute of Electrical Welding.

Prefabricated tanks for oil or other liquids with a capa-

Fig. 10.—Mixing plant for shale and natural gas at a Leningrad storage station.



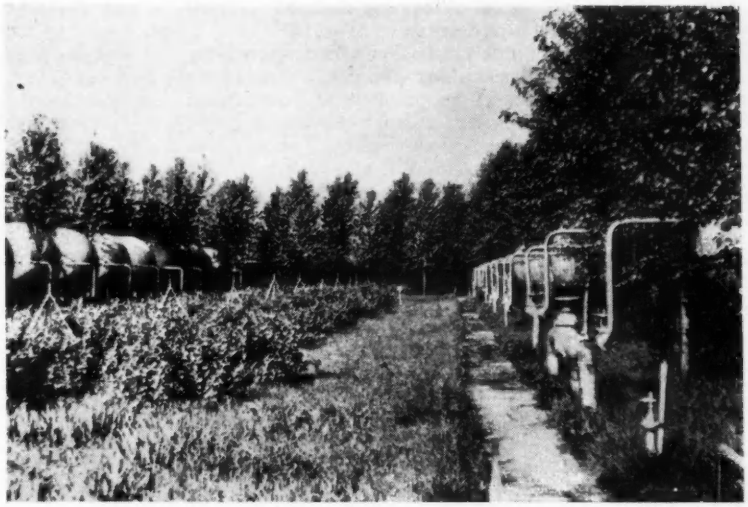


Fig. 11.—H.P. holders at a gas storage station at Leningrad.

city of up to .5 mill. gal. appear to have been made in large quantities. The vertical wall of the tank is assembled on a two stage plant. On the lower stage the plates, graded for thickness from $\frac{1}{3}$ in. to $\frac{1}{16}$ in to correspond with the hydrostatic head in the finished tank, are assembled and welded together automatically on the upper surface. The welded sheets are periodically moved along and are bent over on to the upper platform where the welding is completed on what was formerly the lower surface.

The completely welded wall is then wound on to a reel, which will ultimately serve as a ladder structure inside the tank. The roll, up to 12 ft. dia., is then sent by rail or road to the destination along with a rolled up tank base and tank roof similarly produced.

Assembly of the tank follows in stages with the base being unrolled on to a prepared foundation and the wall roll being erected and uncoiled and finally the roof being added. It is claimed that production is speeded up, manpower requirements per tank are less and the quality of welding is greatly improved.

The production of conventional pipes is being so heavily pressed that novel forms of manufacture are being considered.

Again the problem of transport arises and mains are wasteful in space although some Middle East mains were delivered at 36-in. and 34-in. diameter, the smaller fitting inside the larger. On long journeys there is also risk to ends and because of the limit in length to 40 ft. many joints have to be made under difficult site conditions. The Institute therefore worked on coiled pipes like fire hoses, inflated only when put in service.

Two coils of strip steel up to 660 ft. long by 20 in. wide and 1/15 in. thick are unwound together to form a sandwich which is welded automatically on its edges by an electrical resistance method, and then is pulled through by flattening rollers which coil the double strip into the coils of a drum, which can be up to 13-ft. diameter.

The coil, weighing about 5 tons, is then transported by road or rail to the site where it is unrolled and tested under hydraulic or air pressure. At 10 atmospheres the pipe assumes an almost perfect circular shape with two longitudinal flanges. At 30 to 40 atmospheres the pipe would burst and a working pressure of 10 to 12 atmospheres is adopted. The next coil can be butt welded

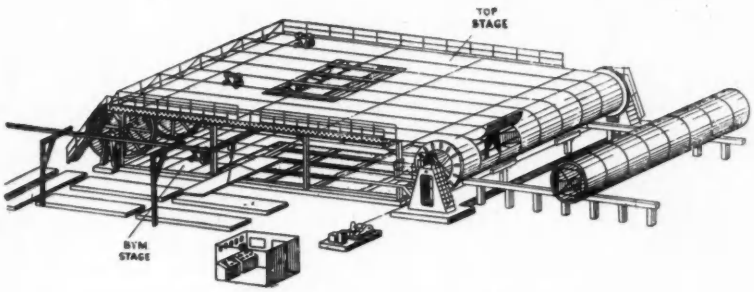


Fig. 13.—Rolled tank prefabrication; a welding technique.

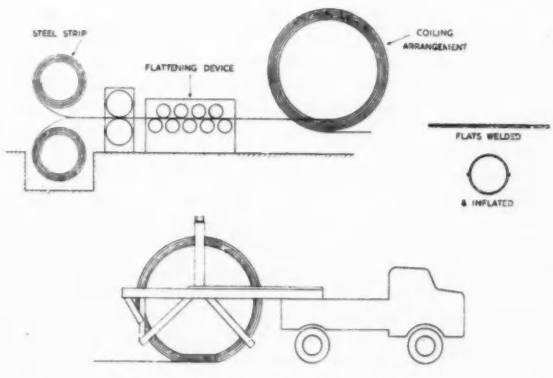


Fig. 14.—Coiled pipes used in the welding technique.

before inflation and special fittings are designed for connection to conventional pipe systems. (Fig. 14).

The short visit gave little satisfaction to a deep curiosity about Soviet systems of education. To satisfy some of the remaining curiosity I talked to graduates and also found much information in Alexander Korol's 'Soviet Education in Science and Technology'[7], in an article on a Trade School in Moscow[8] and in one by I. G. Slater.[9]

Mass education is aimed to be up to secondary school level taking ten years, age 7 to 17, co-educational and standardised throughout U.S.S.R. but varied to meet widely different local conditions.

There are trade schools with a two year training period leading to semi-skilled jobs in industrial maintenance and in 15 years 2.4 mill. workers have been turned out. Job training occupies about half the time.

Technical trade schools have been developed in recent years to provide an alternative outlet other than universities and institutions of higher education for those emerging from the ten-year school.

It would appear that 160,000 engineering graduates or equivalent level are produced each year in U.S.S.R. from a population of 208 mill. or about 8 in 10,000. In Britain, out of a university population of about 116,000, of whom about 38% are reading science and technology, there are about 12,000 graduates per year.

If account is taken of those gaining H.N.C. or professional qualifications by sandwich courses, the 12,000 are increased to 24,000 graduates or equivalent out of a population of 52 mill. or about 5 in 10,000, a lower figure than the Soviet. At sub-professional level the technicum produce about 70,000 trained students per year, and this is to be compared loosely with those taking O.N.C. or City and Guilds, totalling about 250,000, or say 60,000 a year.

Children who show a natural bent for practical work in their seven years State schooling are selected for trade schools. Those below this standard leave school at 15, have a few months or even less depending on production needs in a training division, and then they are put to the bench. There are 3,000 trade schools dealing with 800 trades and producing 700,000 Russian craftsmen (and women) a year.

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Prospect for gas (*continued from p. 469*)

from coal and oil and began to concentrate their efforts on the direct production of methane. The solution of the problem of methane production had already been achieved with the lighter hydrocarbons, and only after long and intensive researches was it possible to attain comparable results, first with heavy oil and then with coal. It was about this time that one of the leaders of the industry is said to have coined the phrase that " the impossible always takes a little longer ". Unfortunately ', adds the author, ' details of exactly how this problem was solved would take too long for me to describe, and it must suffice to say that the solution involved the direct application of atomic energy to the gasification process. The vast quantity of hydrogen still being produced as a by-product of coke manufacture was separated from the other constituents of coal gas by molecular centrifuges and found a ready market in the chemical industry and for the direct reduction of iron and other ores.

'The Wilson Committee had pointed out that processes of total gasification involve enrichment by hydrocarbons in order that the gas produced should conform to the characteristics of the gas which it had to replace or supplement. But they pointed out also that the enriching gas was cheaper than the lean gas produced by these means and, in fact, there was a substantial saving in the cost of gas during the period of increasing calorific value.

'The problem that faced the gas industry ', comments our historian, ' was how to satisfy a rapidly rising demand for gas on a seasonal basis. Fortunately the convenience of the electric fire as a source of heat for topping up the older inefficient heating systems began to relieve the gas industry from the more extreme peak demands and the success that attended an all-out attack on the whole house heating load by central heating, warm air, and the individual room heater, gave a new stability to the winter load.'

It was very necessary, in his view, to scrutinise all new schemes with the object of reducing the capital cost in a supply system whose load factor could be expected to fall to 50% or even less, and he is critical of some of the more popular methods of gasification with oxygen.

He points out that the final solution lay in the storage of gas in underground porous structures, overlaid by impervious cap rock or clay. For a modest initial investment it became possible to establish base load working conditions for the gas producing system and an intensive geological examination revealed enough underground structures to keep pace with the increasing demand for heating gas. But the fact that the cost of such a system of storage was related to the volume stored gave additional impetus to the search for methods of producing methane rather than hydrogen to supplement the methane which was being imported instead of oil, in increasing quantities.

New sources

During all this period of intense geological research it had been hoped that new sources of indigenous natural gas would be located. Although some minor successes are recorded, the final break-through was only made possible when the drilling rigs were taken off shore. After some sharp international exchanges, it was possible for the Gas Act of 1975 to institute a 'North Sea Production Board' with headquarters securely founded on the Dogger Bank.

On this note of optimism our historian ends his record of the progress of the gas industry over the years 1960-1980 and looks forward with confidence to increasing supplies of natural gas to meet the requirements of a growing British economy.

It remains only to say that nothing recorded in this imaginary history of the next 20 years is impossible and that we may in fact be standing on the verge of a revolution in the methods of making, storing and using gas.

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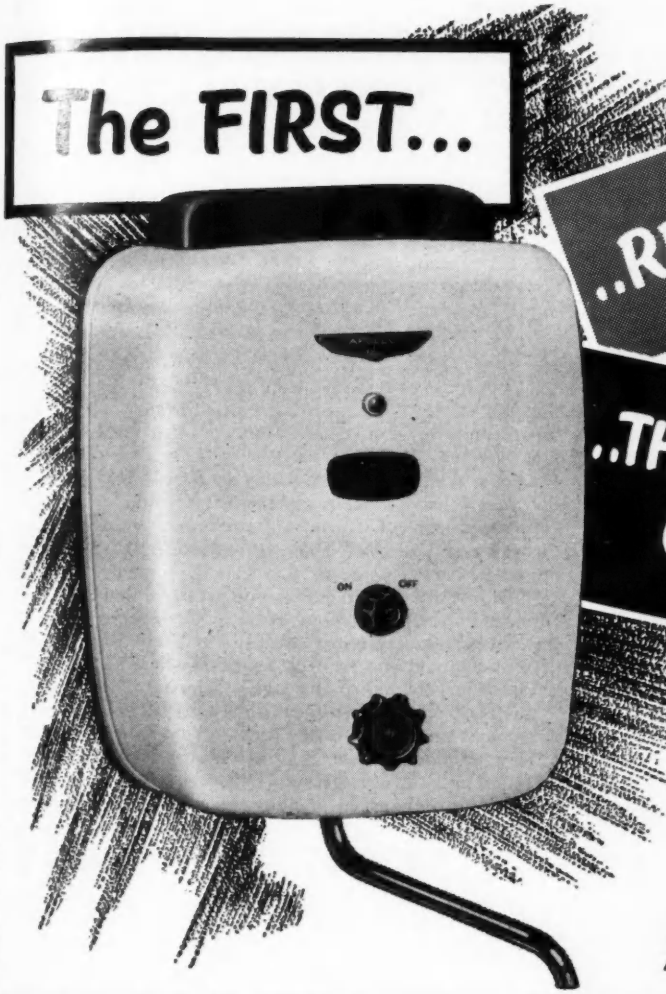

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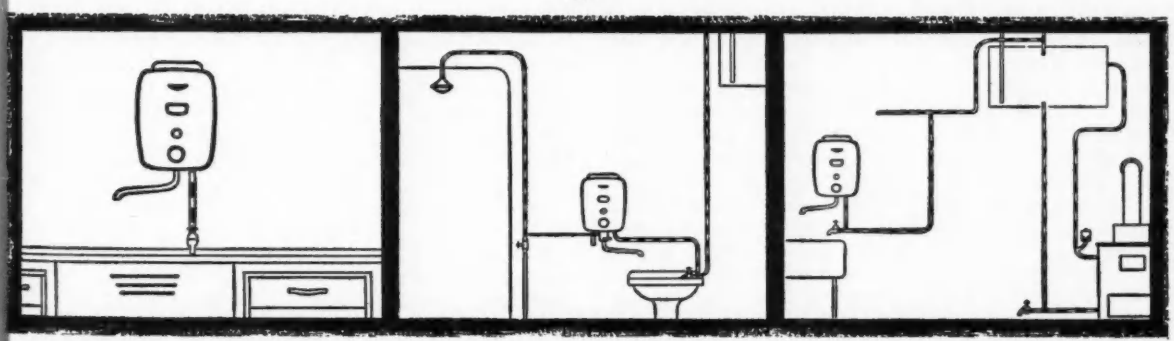

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From a paper read to the East of Scotland Junior Gas Association.

Cathodic protection of high pressure gas pipelines in Scotland

By W. M. R. PATERSON, A.M.I.GAS E.,
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WITH the development in the gas industry in recent years of large scale integration systems and the consequent increase in working pressures, distributing engineers have increasingly turned their attention to steel as a material for pipeline construction.

In the area of the Scottish Gas Board the construction of the high-pressure complete-gasification plant at Westfield, designed to deliver gas into the distribution system at a pressure of 250 p.s.i., has made it essential that steel be used exclusively for high-pressure pipeline construction.

For this reason, consideration has had to be given to the provision of adequate protection against corrosion of a material which is by its nature highly susceptible to corrosive attack when buried in the ground.

Such protection is afforded in two ways, which are essentially complementary one to the other:—

1. By providing an adequate pipe sheathing.
2. By providing cathodic protection.

It is the purpose of this paper to attempt to describe briefly the steps taken in the provision of cathodic protection on those sections of the Scottish Gas Board's supergrid so far completed.

Outline of subject

The fundamental theories of corrosion and cathodic protection have been discussed in a number of papers, text books, pamphlets and technical journals during the past decade. For the purposes of the present paper, therefore, it will be sufficient to give a brief outline of the subject.

The corrosion of buried steel is an electrochemical process and in considering the application of cathodic protection it is assumed that the steel is in intimate contact with the surrounding subsoil—that is to say, the pipe sheathing is in places imperfect.

Electrolytic cells are therefore created, in which parts of the steel pipe form the electrodes, immersed in an electrolyte —the soil.

Due to the great variation in soil composition along the route of a pipeline, certain parts of the pipe become positive electrodes (anodes) and other parts become negative (cathodes). Thus the pipe may be anodic—or cathodic—with respect to adjacent sections or to the surrounding soil.

Whatever the combination of factors arising at any particular time it follows that there will be occasions when parts of the pipe surface are anodic to their surroundings.

At such times, current will flow from these sections to the cathodic sections; metal ions will be removed from the pipe, and eventually pitting will occur.

With a well-coated pipeline, any defects which do occur in the sheathing will restrict the corrosion process to small concentrated anodic areas and therefore penetration of the pipe wall will be comparatively rapid.

The purpose of cathodic protection is therefore to control the formation of these corrosive cells in such a way that the pipeline is at all times *cathodic* with respect to its surroundings.

This is achieved by introducing an over-riding source of potential either by means of 'sacrificial' anodes, or by an 'impressed current' from a transformer/rectifier acting through a ground-bed. This paper is concerned solely with impressed current systems.

The impressed current circuit is so arranged that current is 'drained' from the pipeline at the point of connection of the rectifier, and returned through the ground-bed to the surrounding soil and so back to the pipeline.

Thus the potential of the pipe is depressed with respect to any electrode with which it might be associated—that is, it becomes the cathode every time.

To determine the state of a buried pipe in relation to its surroundings, it is necessary to know its 'pipe/soil potential'. For practical convenience, this is done by measuring the voltage set up in a cell of which the pipe constitutes one electrode, and a standard reference electrode, immersed in the soil, is the other.

The reference electrode most commonly used consists of a copper rod immersed in a saturated solution of copper sulphate. This is known (for obvious reasons) as a 'copper/copper sulphate half-cell'.

The 'natural' potential created by an electrolytic cell of which one electrode consists of buried steel, and the other consists of a copper/copper sulphate half-cell, is normally .55 V. In such a cell, the copper/copper sulphate is the cathode and the buried steel the anode. The natural pipe/soil potential of a buried steel pipe is therefore said to be .55 V. *negative* with respect to a copper/copper sulphate half-cell.

Corrosion voltmeter

It has been found that if the pipe/soil potential is depressed to −.85 V., corrosion will not occur. Where sulphate reducing bacteria are present, a potential of −.95 V. is necessary.

These voltage measurements are made with a corrosion voltmeter, a sensitive instrument incorporating a potentiometer circuit powered by a 4.5 V. dry battery. Briefly, the potential to be measured is balanced to 'zero' by the output of the potentiometer, and the balancing voltage is then read off.

The corrosion voltmeter is thus a basic item of equipment for the designing and operating of a cathodic protection installation.

Experience has shown that with a well-coated pipeline, adequate protection can be achieved with a current density of .05 mA. per sq.ft., whereas a poorly coated line might require .1 mA. per sq.ft., and a bare pipe 1.5 mA. per sq.ft.

The value of a sound sheathing is thus evident as a factor in keeping down power costs during the early years of operation, even though ultimate deterioration of the sheathing will result in increased current consumption with the passage of time.

The pipe coating used on the supergrid consists of factory-applied bitumen-asbestos sheathing, reinforced with woven glass fibre.

Welded joints are protected with a hot-applied bitumen flood-coat, reinforced with fibreglass bandage and externally sheathed with a bitumen-impregnated fibreglass bandage for additional protection against physical shock. All sections of the pipeline are subjected to a strict sheathing inspection before being lowered into the trench.

It was therefore possible to design the cathodic protection installations on the assumption that the current density will not be greater than .05 per sq.ft.

In order to obtain more positive information regarding the quality of the sheathing on the first section of the supergrid to be constructed, it was decided to carry out a current drainage survey on a section of the pipeline, in the summer of 1958.

Temporary installation

This involved the setting up of a temporary cathodic protection installation, using a ground-bed consisting of steel rods and a portable petrol-driven generator to provide the current.

This work was carried out by a firm of corrosion engineers and the results of the survey, over a length of some two miles of 12¾-in. o.d. pipeline, indicated that the coating was well up to standard and in fact a current density of .0125 mA. per sq.ft. was sufficient to give full protection to the test length.

Following upon the current drainage survey, a soil resistivity survey was made of the entire pipeline route between Westfield and Dunfermline—a distance of some 12 miles—to determine a suitable ground-bed location. The main requirements for a ground-bed site are:

1. Low soil resistivity (less than 3,000 ohm per cm.)
2. Availability of power supply.
3. Uniform spread of current to the pipeline protected.
4. Absence of other underground plant in the vicinity.
5. Proximity to the protected pipeline at point of connection.

A suitable site was ultimately found at Norton Farm, Kelty, midway between Westfield and Dunfermline.

From the information obtained in the course of these surveys, a specification was prepared on the basis of which competitive tenders were invited for the provision, erection and commissioning of the necessary equipment.

The equipment for the installation at Norton Farm, Kelty, comprises a pole-mounted transformer/rectifier with a maximum rated output of 10 A. at 24 V., a ground-bed of graphite anodes, and ancillary cablework including an overhead negative lead to the pipeline.

The necessary wayleave for the cathodic protection equipment and the provision of an a.c. supply to the transformer/rectifier was obtained by the Board's Legal Department, at a cost per yard of cable and ground-bed equivalent to that paid in respect of the pipeline itself.

The power supply was not in fact available at the time of installation of the ground-bed, but an extension of the public electricity supply system was under construction, and the a.c. supply was ultimately provided. In order to achieve some protection as quickly as possible, the ground-bed was installed and the necessary current was obtained from a diesel-driven welding generator.

The transformer/rectifier has a maximum output capacity of 10 A. at 24 V., and a rated efficiency of 73% and in view of the constant nature of the electrical load, the Electricity Authority has agreed to dispense with the use of a meter and to calculate the charge for current on the basis of the rectifier setting from time to time.

The change in pipe/soil potential which is the object of any cathodic protection installation can have an adverse effect on other buried structures located between the ground-bed and the protected pipeline; that is to say, it is quite possible that an adjacent water main or electricity cable may be made more anodic to its surroundings by the influence of a cathodic protection installation on a gas pipeline, thus increasing its chances of corrosion.

A body has therefore been set up at national level, namely, the Joint Committee for the Co-ordination of Cathodic Protection of Buried Structures, composed of representatives from the gas and electricity supply industries, water authorities, the General Post Office and oil pipeline companies, to make certain recommendations regarding the operation of cathodic protection installations.

One of these is that before switching on a new installation, an authority shall notify all other interested parties owning plant within the probable sphere of influence of that installation, and afford reasonable assistance in carrying out joint interference testing.

In the case of the installations under review, all owners of 'foreign' structures are informed that on a certain date the installation will be switched on for testing purposes, and they are requested to intimate whether or not they consider that any of their plant is likely to be affected.

Those who do wish to carry out tests then indicate the points at which they wish such tests to be made. On the appointed day, the transformer/rectifier is switched on, and to facilitate testing, an 'on-off' time switch is fitted, operating at ten minute intervals.

Structure/soil potentials are then measured at the selected test points and any anodic 'swing' which occurs when the installation switches on is noted. In certain circumstances, a cathodic swing may be noted, in which case the foreign structure is receiving a measure of protection.

Resistive bonds

The amount of swing which may be considered acceptable has been laid down by the Joint Committee as +20 mV. Anything greater than this must be corrected by inserting a suitable resistive bond between the two structures. Three such bonds have been installed to date on the supergrid between Westfield and Dunfermline; all are in conneetion with G.P.O. cables.

To ensure that the installations are operating at maximum efficiency, periodic checks must be made on the level of protection given. A number of test points have been selected along the route of the pipeline, for this purpose, at which regular pipe/soil potential measurements are taken.

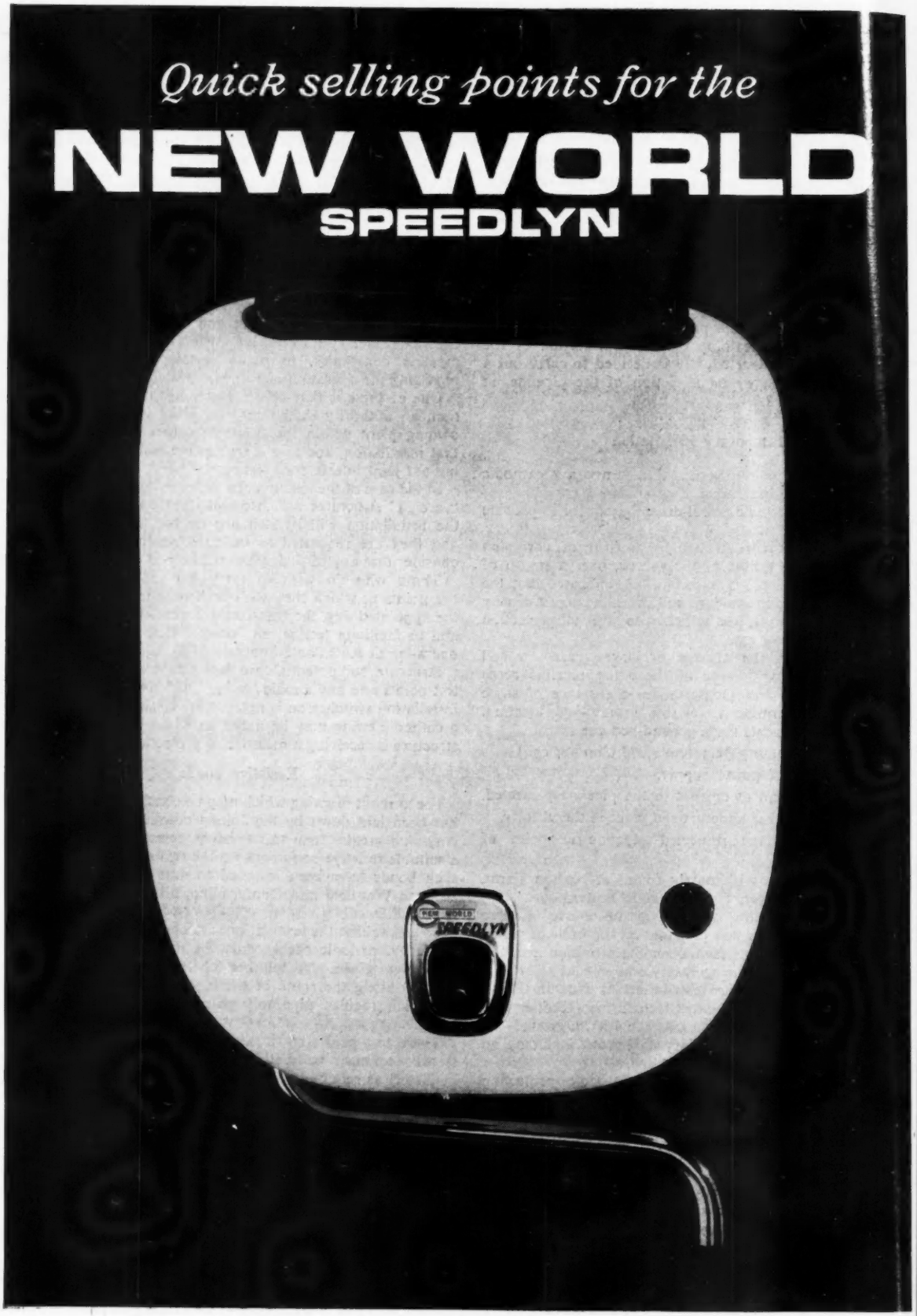
These test points are located at the extremities of protected sections, at rectifier 'drain-points', and intermediately as required. Each visit is recorded on a suitable record card, and adjustments are made from time to time to the rectifier setting to maintain a pipe/soil potential of at least .85 V at the extremities.

In addition, the transformer/rectifiers are inspected regularly, and their output noted. From this information, and knowing the efficiency of the unit, the power consumption is calculated, and notified to the Electricity Authority. Finally, the resistive bonds between the pipeline and foreign structures are checked from time to time to ensure that the potential of the foreign structure is kept within safe limits.

Quick selling points for the

NEW WORLD

SPEEDLYN



This gas waterheater is well-designed both for appearance and performance, and because of its high-speed action is ideal for sink or wash basin.

High-Speed action

Contents (1½ gallons) heat from cold at the press of a button in about 10 minutes. Re-heating only 6½-7 minutes (or less if heater is not completely emptied). Fastest flow from any sink heater at 2 gallons a minute. Full contents can be drawn in ¾ minute.

Easily installed

Gas rate 15,000 B.Th.U. allows connection to existing carcassing, so that no meter change is usually necessary.

Attractive appearance

Neat and compact in white or cream vitreous enamel.

Most economical

Main gas burner used only when needed; shuts off automatically when water is fully heated to 140°F. No maintenance gas rate, apart from pilot light. Radaloy heat exchanger ensures lowest possible maintenance attention.

NEW WORLD

RADIATION DOMESTIC APPLIANCE CENTRE:
59-65 BAKER STREET
LONDON W1
For postal enquiries please write to Head Office:
RADIATION NEW WORLD LIMITED
RADIATION HOUSE
NORTH CIRCULAR ROAD
LONDON NW10
Telephone: WILlesden 1234

NEW WORLD

GAS WATERHEATERS

NEWS SUPPLEMENT

Quality and value for money

HIGH quality goods are only produced by high quality managements and quality itself is a compound of company policy and an extreme effort of spirit by the management to achieve it.

To achieve a high quality in manufacture is much more a problem of work and willpower than it is anything else.

In short, quality and value for money are a measure of the moral fibre of the management.— *Mr. Hugh P. Barker, Chairman of Parkinson Cowan Ltd., and of the British Institute of Management, in an introductory address at the Midlands Management Conference of the Institute, last week.*

I.G.U. COUNCIL IN SESSION

Mr. B. M. Nilsson (Sweden), President of the Council of the International Gas Union, addressing the recent meeting of the Council in London.

Potterton extends 'Down Under'

AN Australian manufacturing and distributing company has been purchased as part of a planned extension of Potterton overseas activities. The announcement was made from Sydney by Mr. E. G. Brooks, Managing Director of Thomas Potterton Ltd., who is on a six-week visit to Australia.

Sir Henry Jones, Chairman of the Gas Council, proposing the toast 'The City of Birmingham' at the Golden Jubilee luncheon of the service of gas to industry held by the West Midlands Gas Board at Sutton Coldfield. Others in the picture (left to right): Alderman J. Lewis, Deputy Mayor of Birmingham and Chairman of the West Midlands Gas Consultative Council; Mr. G. le B. Diamond, Chairman of the West Midlands Gas Board; Mr. R. S. Johnson, Chairman of the East Midlands Gas Board; and Mr. W. R. Branson, Deputy Chairman of the West Midlands Gas Board.

World gas chiefs meet in London

THE Council of the International Gas Union, led by its President, Mr. B. M. Nilsson (Sweden) met in London, last week. Some 30 international experts from a dozen countries arrived by air; some were accompanied by their wives.

Mr. W. K. Hutchison, Deputy Chairman of the Gas Council, who is the Vice-President of the I.G.U., also attended the conference.

The delegates were entertained at a Government reception at Lancaster House.

Members of the I.G.U. Council came from the following countries:—Belgium, Czechoslovakia, Denmark, France, Germany, Holland, Italy, Poland, Rumania, Russia, Sweden, and Switzerland.

New moves against H.P. defaulters

STRABANE (Co. Tyrone) Urban Council Gas Committee has decided upon new moves against hire purchase defaulters. This is the result of a deficit of £1,900 at March, 1960, on hire purchase of appliances.

All defaulters will be interviewed at their premises by an authorised collector, and every effort made to clear up the arrears.

Failing satisfactory settlement, legal proceedings will be instituted and steps taken to disconnect supplies to appliances upon which arrears are due.

MODERN DISPLAY

Latest Radiation showrooms:

Its design will make visitors explore

The new showrooms just opened by the Radiation Group in Baker Street, London W.1, display a wide variety of domestic appliances in an unusual setting. To accommodate the unusual variety of interests the showrooms are divided by coloured transparent screens into a series of 'zones', each devoted to a particular subject

NOVEL architectural treatment has been given to the Radiation Group's new showroom at 59/65 Baker Street, London, W.1. It was designed by Dennis Pugh, A.R.I.B.A., to meet the requirements of a showroom for the display of domestic requirements of numerous varieties, and using differing fuels.

Mr. Pugh has described his approach to the problem as follows:

The problem was to produce a display which could accommodate all these different appliances, and to divide them into 'zones' for each fuel.

The showroom has been designed to avoid the too common approach of showing everything at the same time—creating a display which can bewilder and even hinder concentration, on the part of both customer and salesman.

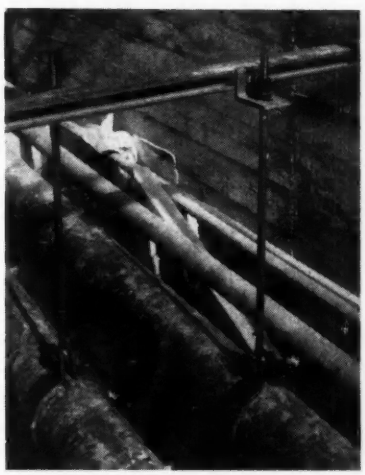
INTIMATE

It was decided to create as intimate an atmosphere as possible within each zone—but to design it in such a way that interchange and revisions of layout could be carried out speedily.

In order to avoid 'running too far in the opposite direction' with a complete isolation of zones, coloured transparent screens have been introduced to excite the customer's interest and promote an inquisitive sense for the next zone.

Much of the equipment on show—New World gas and Jackson electric cookers, Parnall washing appliances, etc.—is 'live' for demonstration purposes, and with the aid of a demonstrator, visitors can go through a complete washday routine with the new washing machines, spin dryers and ironers.

There are also special displays—with expert advice—for architects, builders and heating engineers on the appropriate application of each appliance.



Unistrut pipe supports shown in position in the new North Thames Gas Board pipe trenches at Fulham. Unistrut concrete inserts provide location points for main support beam fixture. Any combination of size of pipe may be suspended from this system. A new addition to the Unistrut range—modular flanged ceiling trunking—has been extensively used for the first time at the Board's new West London offices and laboratories. The architects for the new block, E. R. Collister and Associates, have designed an 'L'—shaped building six storeys high, covering an area of 22,000 sq.ft. in which an estimated 30,000 ft. of Unistrut is to be used.

POST-GRADUATE WELDING COURSE IS ORGANISED

A POST-GRADUATE course in welding technology has been set up by the Ministry of Education.

This was done in response to the representations of the Institute of Welding and the British Welding Research Association, and will be held at the College of Aeronautics, Cranfield.

The course will open in the Autumn of this year.

The minimum enrolment to ensure the holding of the course has been secured as a result of promises from A.E.I. (Manchester) Ltd., British Oxygen Co. Ltd. and Whessoe Ltd.

The British Oxygen Company has also promised to endow two Bursaries for a period of seven years, the candidates to be selected by the Institute.

Specialised training

The purpose of the course is to provide students of graduate status in either metallurgy or engineering with a specialised training to fit them for posts in the design, development and production departments of the many industries where welding is now vital.

There will be a particular concentration on the special metallurgical consideration inherent in welding, the welding process, their characteristics and fields of application, and design for welding and the essential production techniques.

STANDARDS ENGINEERS TO CONFER

THE seventh annual conference of engineers and others concerned with the application of standards, is being held this year on May 9 and 10 and will be opened by Viscount Hailsham, Lord President of the Council and Minister for Science.

It has been decided this year to hold a two-day meeting, with parallel sessions on the second day, to give greater opportunity for detailed discussion.

The first day of the conference will consist of plenary sessions at the Connaught Rooms, London, when Sir Stanley Harley (Coventry Gauge and Tool Co., Ltd.) will take the chair.

After the formal opening by Lord Hailsham, a contribution on the trades union viewpoint on industrial standards will be given by Mr. G. Doughty, of the Association of Engineering and Shipbuilding Draughtsmen.

Papers will also be given on 'An integrated standards programme in the company' Mr. F. E. Butcher, (Joseph Lucas Ltd.), 'Standards in product development (Electronics)' Mr. D. F. Egan (Mullard Ltd.), and 'Standards in market research and sales' (speaker to be announced).

The second day's programme, to be held at British Standards House, will consist of three parallel sessions in the morning and three in the afternoon, to discuss in smaller groups various topics, including: The application of a standards system in a smaller company; steel—variety reduction by manufacturers and users; standardisation in fields where techniques are advancing rapidly; standardisation in a 1-off and batch production company; the unified screw thread in British industry.

FLUIDRIVE CHAIRMAN'S REVIEW

IN his statement presented at the 33rd annual general meeting this month, Mr. J. F. Perry, Chairman of the Fluidrive Engineering Co. Ltd., says: 'Last year I said we realised that "the potential business in all the major industries offers great opportunities, and we have accordingly decided to intensify our sales service." A good deal has been, and is being, done and it is pleasing, therefore, to tell you that the total volume of orders obtained was 20% higher than during the previous year, constituting a record for business from industry as opposed to Government contracts.

'During the current year to date the volume of orders has been substantially increased.

'From the Consolidated Profit and Loss Account you will see that in spite of this lower output the group trading surplus has risen by £17,091 to £364,133. An improvement in the group profits was anticipated in my last report and naturally I am pleased that this has been achieved.

'The group profit before taxation, £182,389, is £16,162 higher than the comparable figure for the previous year. After deducting estimated taxation on the profits of the year and crediting provisions and reserves for taxation no longer required, a net amount of £67,849, the Group Profit is £114,540, £19,643 better than the previous year. The profits for the year of the subsidiary Company, Hydraulic Coupling Patents Ltd., after Taxation, are £22,100, compared with £23,437.'

The Directors are recommending a moderate increase of the dividend on the Ordinary Shares from 12% to 13%.

Gas plant expansion in Canada

APPROVAL has been given in principle to Western Leaseholds to plan the construction of a $6 mill. gas processing plant in the Wildcat Hills gasfield, Alberta, approximately 35 miles north-west of Calgary, says a report in the *Financial Times*.

The Alberta Conservation Board notified the company that formal approval will be given upon the completion of certain arrangements between the company and the Sanitary Engineers Department.

Participants

Participating with Western Leaseholds, which is a subsidiary of Canadian Petrofina, are Shell Oil of Canada, British American Oil Company, Hudson's Bay Oil and Gas, Canadian Pacific Oil and Gas and Imperial Oil.

Several days ago the Board advised Shell of Canada that it will approve a plan for its multi-million-dollar gas processing plant in the Waterton area.

The Home Oil Company and associates has obtained approval from the Alberta Conservation Board for plans to expand its gas processing plant and gathering system in the Carstairs area.

Raw gas feed

The group plans to expand the raw gas feed capacity of the plant to 229 mill. cu.ft. daily from 75 mill. and to increase the investment in the project by $4,366,000 to a total of $7,800,000.

Associated with Home Oil in the project are British American Oil, Canadian Superior of California, Hudson's Bay Oil and Gas, Tennessee Gas Transmission, Alminex, Texaco Exploration, Calgary and Edmonton Corporation, Amurex Oil, Harry Wesley Bass, Southland Royalty, Security Freehold Petroleum and Shell of Canada.

GORDON RESEARCH CONFERENCES FOR 1961

THE Gordon Research Conferences for 1961 on the Chemistry of Coal will be held from June 12 to September 1 at Colby Junior College, New London, New Hampshire; New Hampton School, New Hampton, New Hampshire; Kimball Union Academy, Meriden, New Hampshire; and Tilton School, Tilton, New Hampshire, U.S.A.

A section on 'Science in the preparation of coal,' will be held from June 12-16 at New Hampton School, New Hampton, New Hampshire; Kimball R. A. Glenn as Chairman and Mr. L. L. Newman, Vice-Chairman.

On June 12 Mr. W. A. White, Mr. H. F. Yancey, and Mr. C. C. Harris will speak on 'Behaviour of clays during washing,' while Mr. D. A. Hall, Mr. C. C. Harris, Mr. E. R. Palowitch, and Mr. P. Krumin, will speak on 'Dewatering and drying of coal.'

The following day Mr. R. P. Gardner, Mr. R. L. Brown and Mr. J. A. Harrison will read a paper on 'Breakage of coal'; while Mr. H. B. Charmbury, and Mr. R. P. Gardner will talk on 'Selective pulverisation.'

On June 14 Mr. R. L. Brown, Mr. D. A. Hall, and Mr. J. R. Garvey cover 'Flow of coal'; and Mr. J. L. Bayer, Mr. H. L. Benedict, with Mr. J. A. Harrison are to talk on 'Effects of preparation on petrographic composition'.

'Froth flotation processes' will be dealt with by Mr. I. N. Plaksine, and Mr. V. I. Klassen on June 15.

Mr. I. N. Plaksine and Mr. N. F. Olofinsky will speak on 'Electrostatic cleaning'; Mr. E. R. Palowitch on 'Thermomagnetic separation of pyrite'; and Mr. M. R. Greer on 'Dense-medium cyclone'.

On June 16, Mr. D. A. Hall, Mr. A. M. Wandless, and Mr. P. G. Meerman will speak on 'Quality control'; and Mr. L. L. Newman on 'Coal gasification'.

PERSONAL NOTES

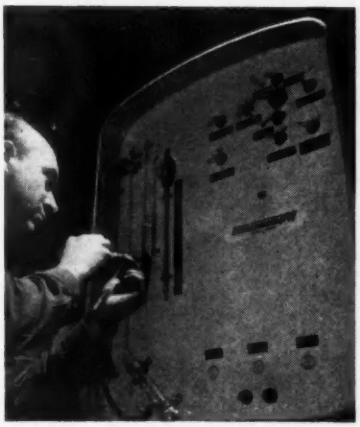
MR. A. CONGREVE, Chairman of Humphreys & Glasgow, Ltd., of London, is visiting the principal South and Central American cities in a three-week tour. He is accompanied by MR. D. C. LENNON, an Associate Director. The 20,000 mile tour began in New York, and the schedule includes Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Lima, and Mexico City.

MR. A. DITCHER has been appointed Manager of the Surface Division of Richard Sutcliffe Ltd. Mr. Ditcher joined Sheepbridge Engineering in 1951 and served with them as chief draughtsman and contracts manager before being appointed general sales manager two and a half years ago.

SIR COLIN CAMPBELL, O.B.E., has been appointed Chairman of the South Western Gas Consultative Council. ALDERMAN H. SUTCLIFFE, has been appointed Chairman of the North Eastern Gas Consultative Council.

MR. WILLIAM WILKINSON has retired, aged 65, after 18 years as distribution superintendent at Kinsley gasworks. He has served the gas industry for 36 years.

MR. J. W. MARTIN, Director and Sales Manager of Whessoe Ltd., will be retiring on March 31 after 37 years with the Company.



This gas chromatograph, invented by chemical engineer László Szeplessy at the Research Instruments Manufacturing Centre of the Hungarian Academy of Sciences, cuts the time needed for a gas analysis from the two-three hours of conventional methods to half an hour. Picture shows instrument maker László Arva making final adjustments.

FORTHCOMING EVENTS

April 7.—SCOTTISH WESTERN JUNIORS: 'Pipeline Under the Forth,' by R. O. Emmony.

April 7. — LONDON AND SOUTHERN JUNIORS: 'Laboratory and Field Experience in Warm Air Heating,' by E. W. G. Dance and P. R. Chance.

April 8. — MANCHESTER DISTRICT JUNIORS: Visit to Partington Works, Manchester. Paper on 'Development in the Utilisation of Refinery Gas at Partington,' by N. Hoyle.

April 8.—ASSOCIATION OF TEACHERS OF GAS SUBJECTS: Training Centre of West Midlands Gas Board, 86, Saltisford, Warwick. Annual General Meeting. 2 p.m.

April 12.—WESTERN JUNIORS: Bristol. Visit to W. D. and H. O. Wills.

April 14.—I.G.E., MIDLAND SECTION: Penns Hall Hotel, Walmsley, Sutton Coldfield. Annual General Meeting. 2.30 p.m.

April 17.—EASTERN G.C.C.: Connaught Rooms, Great Queen Street, London, W.C.2.

April 18.—MIDLAND JUNIORS: Staff Mess Room, West Midlands Gas Board, Birmingham District, Council House, Birmingham. Annual General Meeting.

April 19 and 27.—EASTERN JUNIORS: Visit to Stewarts and Lloyds Works.

Robbery attempt

Thieves recently attempted to break open two safes in the East Midlands Gas Board's showrooms and offices in Knifesmithgate, Chesterfield. In the early hours of the morning a policeman saw that the back door had been broken open. An attempt to blow open one of the safes had failed, and the second safe had been wired ready for blowing.

BOARD SHOWS EQUIPMENT FOR CATERERS

ENQUIRIES from as far afield as Scotland, Wales and the East Coast showed the interest attracted by the West Midlands Gas Board display at the recent Hoteliers, Caterers and Catering Equipment Exhibition held in Birmingham.

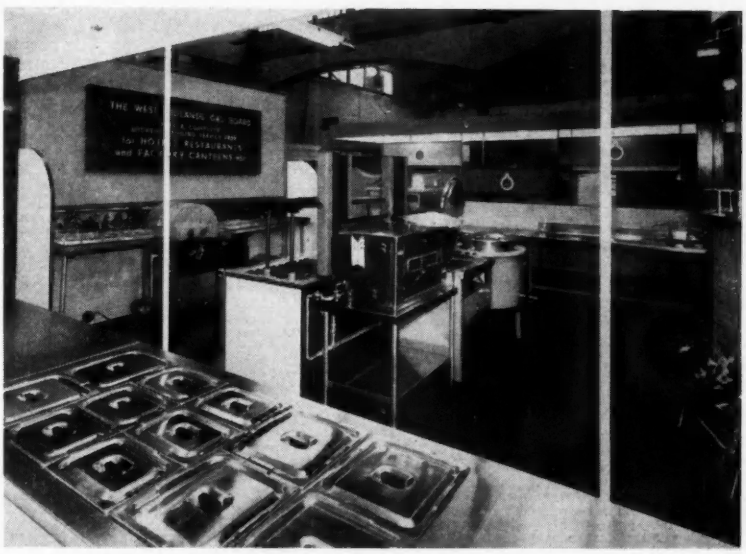
On the stand a kitchen was erected with capacity to cater for about 150 people. The equipment on show illustrated the wide choice available to the catering industry.

Several appliances were live and students from domestic science colleges in the Midlands accepted an invitation to inspect and operate the appliances.

Visitors saw chickens cooked on a Briffault rotating spit.

With the appliances were sets of photographs depicting catering installations carried out by the Board in cafés, schools, factories and hotels.

Prominence was given to an announcement that the West Midlands Gas Board gives free advice on planning and equipping a kitchen.



The equipment displayed included: Bartletts—countering, sink unit, tabling: Benhams—steamer; Briffault—chicken spit; Adams—Adastra display unit; Stills—heavy duty grill; Stotts—autofry deep fat fryer; Stotts—dual purpose boiling pan; Radiation—Mayfair heavy duty range (1 solid top, 1 open top); Jackson—F.2. café set; and Hobart LE3C (gas heated)—dishwasher.

PUBLISHERS' NOTICE

The "Gas Journal" is published every Wednesday, price 1/6d.; by post 1/9d.

Subscription Rates : Home 65/- ; Overseas 72/6 per annum ; (Both payable in advance.) A copy of the "Gas Journal" Directory is presented each year to continuous subscribers.

Classified Advertisements : All small classified advertisements are charged at 3/6 per line (approx. 7 words)—minimum charge 10/6. A Box Number address occupies 2 lines, and a further 1/- is charged toward cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's journal.

Displayed Advertisements : Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10in. deep x 7 in. wide; block screen 120.

BUSINESS MANAGER S. T. CULLEN

NORTHERN MANAGER: J. W. Courtney, 65, Foundry Avenue, Leeds, 8. *Telephone*: Leeds 655854

SOUTHERN REPRESENTATIVE: R. F. Crocker, 11, Bolt Court, Fleet Street, London, E.C.4. *Telephone*: FLEet Street 2236-7

MIDLANDS REPRESENTATIVE: Gerald F. Harwood, 76, Broad Lane, Kings Heath, Birmingham, 14. *Telephone*: Highbury 4502.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: FLEet Street 2236-7. *Telegrams*: Gasking, Fleet, London. 22—7/58

J. BROWN & CO. LTD
SAVILE TOWN, DEWSBURY, YORKS.

Supply:—

"BROWNOX-de-LUXE" PURIFYING MATERIAL

Purchase:—

SPENT OXIDE

PATENTS AND TRADE MARKS

KINGS PATENT AGENCY, LTD.
(Director, B. T. King, A.I.M.E.), Patent and Trade Mark Agents, 146a Queen Victoria Street, London, E.C. Booklet on request. City 6161.

APPOINTMENTS VACANT

WEST MIDLANDS GAS BOARD

BIRMINGHAM AND DISTRICT DIVISION

VACANCIES FOR
NEW BUILDINGS INSPECTORS,
SALES AND SERVICE DEPARTMENT

THE successful candidates will be responsible for liaison with builders, architects and local authorities in connection with gas installations for all types of new housing, including multi-storey flats, commercial and industrial premises.

The duties will include the preparation of the design, specification and quotation for such installations, and the supervision of work in progress.

A sound knowledge of gasfitting practice and modern gas appliances is essential, and possession of the City and Guilds Certificate in Gas Technology (Supply) will be an advantage.

There is one post within the range of £770 to £870 per annum and another within the range £830 to £930 per annum. The person appointed to the second post will be required to deputise for the Senior Buildings Inspector in his absence.

Applications, stating age, present position, qualifications and experience, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Edmunds Street, Birmingham, 3, **to reach him not later than April 5, 1961.**

SOUTH EASTERN GAS BOARD

CHEMICAL STAFF
PORTSLADE WORKS

APPLICATIONS are invited to fill vacancies in the Chemical Laboratory at the Portslade Works.

One vacancy is for a Chemical Assistant in Grade 6 (Provincial 'A ') £710-£810 per annum.

Other vacancies are within Grade 4-6 (Provincial ' A ') £505-£810 per annum according to qualifications and experience.

Applications in writing, quoting reference V10/1427 and giving full details, should be sent to the Personnel Manager, Katharine Street, Croydon, within seven days.

JERSEY GAS LIGHT COMPANY LIMITED

APPLICATIONS are invited for the position of District Superintendent, who will be responsible for the efficient control of Sales, Consumer Service and Distribution (including high pressure).

Salary £1,250 per annum. A house will be available on rental.

Applications stating age and giving particulars of education, training, qualifications and experience together with the names of two referees, should reach the undersigned not later than April 17, 1961.

W. WEDGWOOD,
Engineer and Manager.

Bath Street,
Jersey, C.I.

RESEARCH AND DEVELOPMENT

DOMESTIC HEATING

LEADING U.K. manufacturers of solid fuel, oil and gas-fired domestic heating appliances and boilers invite applications from suitably qualified persons for the position of Assistant to the Technical Manager in their Research and Development Laboratory.

University degree or a recognised professional or technical qualification is desirable, and previous technical experience in the fuel and/or appliance industries an advantage.

This is a senior position commanding good salary, with excellent working conditions in pleasant country surroundings.

All applications to the Secretary, Radiation Parkray Limited, Park Foundry, Belper, Derby.

SCOTTISH GAS BOARD

CENTRAL AND NORTHERN DIVISION

DISTRIBUTING TECHNICAL ASSISTANT
KIRKCALDY DISTRICT

APPLICATIONS are invited for the position of Distributing Technical Assistant, based on Kirkcaldy.

The person appointed will be responsible for assisting in the organisation, supervision and technical control of Distributing work within the Kirkcaldy District.

The Salary Grade appropriate to this position is A.P.T. 7/8 (£770 to £930 per annum) with placing according to qualifications and experience.

The post is pensionable, and the successful applicant will be required to pass a medical examination.

Applications, giving age, education, qualifications and experience should reach the Personnel Officer, The Scottish Gas Board, Friarton, Perth, not later than Saturday, April 15, 1961.

EAST MIDLANDS GAS BOARD

LINCOLNSHIRE DIVISION

AS a result of promotion, two vacancies have arisen for:—

SALES and SERVICE OFFICERS

(a) SCUNTHORPE

The salary will be within the range £975/£1,180 p.a.

This is a rapidly expanding district, and although the major industry is steel mills, is situated in pleasant rural surroundings. There is the prospect of a Local Authority house being available within 3/4 months.

(b) SPALDING/STAMFORD

The salary will be within the range £895/£1,095 p.a.

This is a prosperous and predominantly agricultural district.

Both districts already have good sales records, the successful applicants must, therefore, have the ability to supervise the technical and administrative sections and to inspire the sales teams to higher achievements.

Detailed applications, stipulating the appointment desired and quoting two referees, should be made immediately to:—

B. CLARKE,
Divisional General Manager.

Belle Vue House,
Carline Road,
Lincoln.

CASES FOR PERMANENT BINDING

Quarterly Volumes of the 'Gas Journal'

9/6 each, post free

Walter King, Ltd.,
11, Bolt Court, Fleet Street,
London, E.C.4